

**METHOD AND APPARATUS FOR RECONSTRUCTING A
SURFACE USING A BALL-PIVOTING ALGORITHM**

Abstract of the Disclosure

5 A method and apparatus are disclosed for finding a triangle mesh that
interpolates a set of points obtained from a scanning system. A ball-pivoting algorithm
computes a triangle mesh interpolating a given point cloud. The disclosed ball-pivoting
algorithm triangulates a set of points by “rolling” a ball of radius ρ on the point cloud.
The points are surface samples acquired with multiple range scans of an object. The
10 ball-pivoting algorithm starts with a seed triangle, and pivots the ball of a given radius, ρ ,
around an edge of the triangle. During the pivoting operation, the ball revolves around
the edge while keeping in contact with the edge's endpoints. The ball pivots until it
touches another scan point, forming another triangle. The ball-pivoting operation
continues until all reachable edges have been tried, and then starts from another seed
15 triangle, until all scan points have been considered. The ball-pivoting algorithm is related
to alpha-shapes, and given sufficiently dense sampling, it reconstructs a surface
homeomorphic to and within a bounded distance from the original manifold.

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